

Worksheet 10 (Graph Theory 2): Shortest distance on a graph

Group Names: Solutions

1. Use Dijkstra’s Algorithm to determine the shortest (weighted) distance between vertex  $S$  and each other vertex in the graph. Break any ties by choosing the vertex that comes earlier in the alphabet.

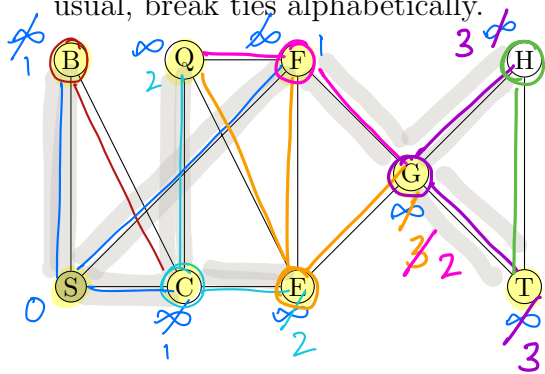
Keep track of the steps of the algorithm in the table to the right of the graph, and then fill in the final shortest distances between  $S$  and each other vertex below.

vertex	distance from $S$
S	0
A	5
B	2
C	4
D	1
E	5
F	8
H	7
T	8

order	Explored?	vertices	tentative distances
(1)	✓	S	0
(2)	✓	D	∞, 1
(3)	✓	B	∞, 2
(5)	✓	A	∞, 5, 8
(4)	✓	C	∞, 4
(6)	✓	E	∞, 5, 9, 16
(9)	✓	T	∞, 8, 13
(7)	✓	H	∞, 7, 16
(8)	✓	F	∞, 8, 9

...continued on the back side

2. We can also use Dijkstra’s algorithm to find the shortest distance between two vertices in a graph that does not have weights on the edges, by assuming all of the weights are 1. As usual, break ties alphabetically.



vertex	distance from $S$
S	0
B	1
C	1
Q	2
F	1
G	2
H	3
T	3
E	2

Explored?	vertices	tentative distances						
✓	S	0						
✓	B	1	<del>2</del>					
✓	C	1						
✓	E		2	<del>3</del>				
✓	F	1						
✓	G			<del>3</del>	2			
✓	H						3	
✓	Q		2	<del>4</del>	<del>2</del>			
✓	T						3	<del>4</del>

What is the (shortest) distance between  $S$  and  $T$ ? 3